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<th>Publication Number:</th>
<th>MITS 03I Edition 1 Revision 0</th>
</tr>
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<tr>
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<td>July 2019</td>
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<tr>
<td>Endorsed By:</td>
<td>Karl Cloos Director, Infrastructure Planning</td>
</tr>
<tr>
<td>Approved By:</td>
<td>Ken Marshall Executive Branch Manager, Roads ACT</td>
</tr>
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**Document Information**

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<th>Document</th>
<th>Key Information</th>
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<tr>
<td>Document Title</td>
<td>MITS 03I Subsurface drainage</td>
</tr>
<tr>
<td>Next review date</td>
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<tr>
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<td>1171 Subsurface drainage</td>
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**Revision Register**

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1 SUBSURFACE DRAINAGE

1.1 General

1.1.1 Cross references
General: The following documents are related to this Specification.

1.1.1.1 ACT Legislation
Road Transport (General) Act
Public Roads Act
Scaffolding and Lifts Act
Scaffolding and Lifts Regulation
Work Health and Safety Act

1.1.1.2 Specifications
Requirement: Conform to the following:

MITS 00 Preliminaries
MITS 01 Traffic Management
MITS 02 Earthworks
MITS 04 Flexible pavement construction
MITS 06 Concrete kerbs, paths and driveways
MITS 08 Incidental works
MITS 09 Landscape
MITS 10 Concrete works
MITS 16 WSUD Features

1.1.2 Referenced documents

1.1.2.1 Standards
General: The following documents are incorporated into this Specification by reference:

Australian standards

AS 1141 Methods for sampling and testing aggregates.
AS 1141.11.1 Particle size distribution by dry sieving.
AS 1141.22 Wet/dry strength variation.
AS 1289 Methods of testing soils for engineering purposes.
AS 1289.5.5.1 Soil compaction and density tests - Determination of the minimum and maximum dry density of a cohesionless material - Standard method.
AS 1289.5.6.1 Soil compaction and density tests - Compaction control test - Density index method for a cohesionless material
AS/NZS 1477 PVC pipes and fittings for pressure applications.
1.1.3 Standards

1.1.3.1 General

Standard: To AGPT10.

Proprietary products: To TCCS Products previously considered for use list

1.1.4 Interpretation

General: For the purposes of this Specification the following abbreviations apply:

TCCS: Transport Canberra and City Services, ACT Government and its successors.

1.1.4.1 Definitions

General: For the purpose of this Specification, the definitions of terms used to define the components of the road reserve are in conformance with AS 1348, Glossary of Austroads Terms and AGRD03, the definitions given below also apply:

Subsurface drainage: Includes subsoil drains, foundation drains and drainage mats.
1.1.5 Hold points and witness points

1.1.5.1 Notice

General: Give written notice to the Authorised Person so that the documented inspection and submissions may be made to Hold point table and the Witness point table.

Table 3I-1 Hold point table

<table>
<thead>
<tr>
<th>Item</th>
<th>Clause title</th>
<th>Requirement</th>
<th>Notice for inspection</th>
<th>Release by</th>
</tr>
</thead>
<tbody>
<tr>
<td>3I.1</td>
<td>Subsurface drainage pipes - General</td>
<td>Submit compliance certificates</td>
<td>5 working days before ordering</td>
<td>Authorised Person</td>
</tr>
<tr>
<td>3I.2</td>
<td>Other types of subsurface drainage pipes - Alternatives</td>
<td>Submit details of proposed alternative pipes and evidence of conformity for approval.</td>
<td>5 working days before ordering</td>
<td>Authorised Person</td>
</tr>
<tr>
<td>3I.3</td>
<td>Geotextile - Properties</td>
<td>NATA compliance certificates, sample and manufacturer’s instructions.</td>
<td>5 working days before ordering</td>
<td>Authorised Person</td>
</tr>
</tbody>
</table>

Table 3I-2 Witness point table

<table>
<thead>
<tr>
<th>Item</th>
<th>Clause title</th>
<th>Requirement</th>
<th>Notice for inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>3I.1</td>
<td>Site Establishment - Excavation</td>
<td>Unsuitable material removal and disposal to MITS 02B Bulk earthworks</td>
<td>Progressive</td>
</tr>
<tr>
<td>3I.2</td>
<td>Site Establishment - Excavation</td>
<td>Spoil site locations to MITS 02B Bulk earthworks</td>
<td>Prior to placement</td>
</tr>
</tbody>
</table>
1.2 Materials

1.2.1 Subsurface drainage pipes

1.2.1.1 General
Approval: Before providing pipes, submit compliance certificate and test results determined from AS 2439.1 as evidence that the pipes, including connections to structures, conform to the requirements of this Specification.

This is a HOLD POINT.

1.2.1.2 Corrugated circular plastic pipe and fittings
Pipe: Conform to the following:
- Standard: To AS 2439.1.
- Class: 1000, 100mm diameter as shown on the drawings.
- Type: Slotted, except where shown otherwise on the drawings.

Fittings: Provide joints, couplings, elbows, tees and caps as follows:
- To AS 2439.1.
- To the manufacturer’s recommendations.

1.2.1.3 Solid walled uPVC subsoil pipes
General: Provide subsoil pipes without slots and otherwise complying to this Specification for connection to flushing points.

1.2.2 Other types of subsurface drainage pipes

1.2.2.1 Alternatives
Approval: Perforated or slotted pipes of other materials including uPVC and FRC may be accepted as an alternative subject to compliance with this Specification. Submit full details of the type of pipe, certification from the manufacturer of its suitability and quality for use in each particular application. Address the crushing strength, flexural strength, jointing system and slotting details.

This is a HOLD POINT.

1.2.3 Filter material

1.2.3.1 General
Quality: Clean, hard, tough, durable particles.

Where subsoil drains are laid in or adjacent to planted areas: Ensure the PH of the filter material is within the range 6 – 7.
1.2.3.2 Type A filter material
Source: Crushed rock or granular material.
Grading: To the Type A filter material table.
Use: In trench drains and Type B drainage mats: To MITS 03K Drainage mats.

<table>
<thead>
<tr>
<th>Table 3I-3 Type A filter material table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test method</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>AS 1141.11.1</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

1.2.3.3 Type B filter material
Source: Granular material.
Grading: To the Type B filter material table.
Coefficient of saturated permeability: At least 8 m/day after three hours of flow when compacted to its maximum dry density in conformance with AS 1289.5.5.1 and then tested to conform to ASTM D2434 68.
Grading variation as a result of compaction processes: To the Type B filter material variation table.
Use: In trench drains and Type A drainage mats: To MITS 03K Drainage mats.

<table>
<thead>
<tr>
<th>Table 3I-4 Type B filter material table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Method</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>AS 1141.11.1</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3I-5 Type B filter material variation table</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS Sieve</td>
</tr>
<tr>
<td>2.36 mm</td>
</tr>
<tr>
<td>1.18 mm</td>
</tr>
<tr>
<td>425 μm</td>
</tr>
<tr>
<td>300 μm</td>
</tr>
<tr>
<td>150 μm</td>
</tr>
<tr>
<td>75 μm</td>
</tr>
</tbody>
</table>
1.2.3.4 Type C filter material

Source: Crushed rock.

Grading: To the Type C filter material table.

Use: In Type A drainage mats: To MITS 03K Drainage mats.

Table 3I-6 Type C filter material table

<table>
<thead>
<tr>
<th>Test Method</th>
<th>Property</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 1141.11.1</td>
<td>Maximum particle size</td>
<td>37.5 mm</td>
</tr>
<tr>
<td></td>
<td>Maximum passing the 9.5 mm AS Sieve</td>
<td>5% by mass</td>
</tr>
<tr>
<td></td>
<td>Maximum (D90:D10)* or (see Note)</td>
<td>3</td>
</tr>
<tr>
<td>AS 1141.22</td>
<td>Minimum wet strength</td>
<td>100 kN</td>
</tr>
<tr>
<td></td>
<td>Maximum 10% fines wet/dry variation</td>
<td>30%</td>
</tr>
</tbody>
</table>

**Note:** The D90 value is determined by sieving the material using 75mm, 53mm, 37.5mm, 26.5mm, 19mm, 13.2mm and 9.5mm AS sieves, as appropriate, and then plotting the results on a graph of AS sieve size v percentage passing. The plotted points to be joined by straight lines and the D90 value determined as the theoretical sieve size corresponding to 90% passing.

D10 denotes the theoretical size of a sieve through which 10% of the material would pass and is to be determined from the same graph used to determine the D90 value.

1.2.3.5 Type D filter material

Source: Uncrushed river gravel.

Description: Rounded aggregate to AS 2758.1 Table B1 Appendix B.

Grading: To the Type D filter material table.

Use: In Type A and Type B drainage mats: To MITS 03K Drainage mats.

Table 3I-7 Type D filter material table

<table>
<thead>
<tr>
<th>Test Method</th>
<th>Property</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 1141.11.1</td>
<td>Maximum particle size</td>
<td>75 mm</td>
</tr>
<tr>
<td></td>
<td>Maximum passing the 9.5 mm AS sieve</td>
<td>5% by mass</td>
</tr>
<tr>
<td></td>
<td>Maximum (D90 : D10)</td>
<td>3</td>
</tr>
<tr>
<td>AS 1141.22</td>
<td>Minimum wet strength</td>
<td>100 kN</td>
</tr>
<tr>
<td></td>
<td>Maximum 10% fines wet/dry variation</td>
<td>30%</td>
</tr>
</tbody>
</table>
1.2.3.6 Type E filter material
General: Type E filter material shall be used in subsoil drains within planting beds and playground softfall areas where nominated on the Drawings.

Requirement: Where subsoil drains are laid in or adjacent to planted areas, ensure the pH of the filter material is within the range 6 – 7.

Source: Clean washed drainage sand

Grading: To the Type E filter material table.

Table 3I-8 Type E filter material table

<table>
<thead>
<tr>
<th>Test Method</th>
<th>Property Material passing AS sieve</th>
<th>Requirement % by mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 1141.11.1</td>
<td>9.5 mm</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>4.75 mm</td>
<td>98 to 100</td>
</tr>
<tr>
<td></td>
<td>2.36 mm</td>
<td>70 to 100</td>
</tr>
<tr>
<td></td>
<td>1.18 mm</td>
<td>30 to 78</td>
</tr>
<tr>
<td></td>
<td>600 μm</td>
<td>2 to 15</td>
</tr>
<tr>
<td></td>
<td>300 μm</td>
<td>0 to 4</td>
</tr>
<tr>
<td></td>
<td>150 μm</td>
<td>0 to 1</td>
</tr>
</tbody>
</table>

1.2.3.7 No fines concrete
Use: Where specified on the Drawings.

Material properties: Conform to the following:

> Aggregate to cement ratio: between 6:1 and 8:1 by mass.
> Water to cement ratio: 0.35 to 0.45 by mass.
> Shape: Minimum 98% by mass of aggregate with one fractured face.

Grading: To the No fines concrete filter material table.

Table 3I-9 No fines concrete filter material table

<table>
<thead>
<tr>
<th>Test Method</th>
<th>Property Material passing AS sieve</th>
<th>Requirement % by mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 1141.11.1</td>
<td>26.5 mm</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>19.0 mm</td>
<td>95 to 100</td>
</tr>
<tr>
<td></td>
<td>9.5 mm</td>
<td>0 to 5</td>
</tr>
</tbody>
</table>
1.2.4 Geotextile

1.2.4.1 Properties

Type: As shown on the Drawings.

Geotextile materials for curtain drains: Polyester, polypropylene or polyethylene.

Minimum material properties: Filter fabric shall be a non woven type with the following properties:

- Elongation: ≥30% to AS3706.4
- Grab Strength: >500N to AS 2001.2.3 Method B
- Tear Strength: >180N to AS 3706.3.
- Filtration: To AGPT04G Table 4.1 flow rate ≥ 50 litres/m2/second and permittivity ≥ 0.5 / second to AS 3706.9.

Submit: For approval the proposed geotextile material and NATA certificates of compliance. Submit a sample of the fabric, the manufacturer information and installation instructions.

This is a HOLD POINT.

Classification: Properties, functions, design and construction requirements to AGPT04G.

Specification: Material type and minimum mass requirements as shown on the Drawings.

Quality: Free of any flaws, stabilised against UV radiation, rot proof, chemically stable, low water absorbency. Filaments must resist delamination and maintain their relative dimensional stability.

Robustness and strength: Conform to the following:

- Classifications for robustness and strength cited in AGPT04G.
- Select material based on tests and subgrade conditions for the relevant location/function.
- Rate of water flow: under 100mm constant head determined using the perpendicular flow test to conform to AS 3706.9.

1.2.4.2 Storage

Storage: Under protective cover or wrapped with a waterproof, opaque UV protective sheeting to avoid any damage prior to installation. Store to conform to manufacturer's recommendations.

Damage: Must not be stored directly on the ground or in any manner that adversely affect the material by heat, dirt or damage.

Label: Make sure the geotextile material is clearly labelled showing manufacturer, type and batch number.

1.2.4.3 Seamless tubular filter fabric

Material: Either polypropylene or polyester seamless knitted tubular filter fabric.

Arrangement: Enclose slotted pipe 100mm diameter.

Properties: Free of imperfections in weave or yarn, abrasion resistance and weave stability qualities such that it does not form holes, ladder, de-weave, tear or unravel more than 5mm from a cut end.

Representative large opening size: Between 200 and 500µm.

Damaged filter fabric: Remove and replace filter fabric that is torn, excessively stretched or otherwise damaged during transportation, storage, fitting of the fabric or pipe laying.
1.3 Execution

1.3.1 Provision for traffic

1.3.1.1 General
Requirement: Conform to MITS 01 Traffic Management.

1.3.2 Site establishment

1.3.2.1 Survey
Requirement: Confirm site surface and benchmarks. Conform to MITS 00 Preliminaries.

1.3.2.2 General
Excavation: Conform to MITS 03A Trenching for underground services and MITS 02B Bulk Earthworks.

1.3.2.3 Excavation
Over-excavation: If the trench is excavated below the documented level, backfill the trench to the documented level with non-porous subgrade material compacted to a relative compaction of at least 95% Standard compaction as determined by AS 1289.5.4.1.

Unsuitable material: Notify the Authorised Person of any unsuitable material and seek a direction for removal. Dispose of the unsuitable material as approved or directed. Replace unsuitable material to MITS 03A Trenching for underground services.

This is a WITNESS POINT.

1.3.2.4 Backfilling
Backfill: To MITS 03J Subsoil and foundation drains or MITS 03K Drainage mats. Stockpile and handle filter material to prevent contamination.

Compaction: Compact cohesionless material to a Density Index of 70% determined by AS 1289.5.6.1.

1.3.3 Outlet structures

1.3.3.1 Discharge
Subsurface drainage pipes: Connect discharge into sumps or to outlet structures. The outlet of the subsurface drain shall not be lower than the highest obvert of other pipes at the point of connection.

> Where discharge is to the surface or an open drain, construct an endwall as detailed.
> Where discharge is to drainage structures provide 100mm diameter uPVC pipe sleeving through the penetration.

Outlet intervals: 150m maximum

Rodent proofing: Secure outlets, including those discharging into sumps, with galvanized wire netting.
1.3.3.2 Outlet pipe
Type: Provide unslotted outlet pipes from subsurface drains.

Levels: Ensure no point in an outlet pipe is higher than the pipe at the end of the curtain drain.

Concrete for outlet structures: Concrete to conform to MITS 10 Concrete works.

1.4 Completion

1.4.1 Submissions
Work as Executed Records: To MITS 00B Quality Requirements.

2 MEASUREMENT AND PAYMENT

2.1 Measurement

2.1.1.1 General
Payments made to the Bill of Quantities: To MITS 00A General requirements, this Specification, the drawings and Pay items.

2.1.1.2 Methodology
The following methodology will be applied for measurement and payment:

> Allow for all work, materials, testing and quality assurance requirements in each Pay Item.
> Temporary erosion and sedimentation control measures: To MITS 00C Control of erosion and sedimentation.
> Removal of unsuitable material: To conform to MITS 03A Trenching for underground services.
> Subsoil drains: To MITS 03J Subsoil and foundation drains.
> Drainage mats: To MITS 03K Drainage mats.
> Subsurface drainage for Ponds, Wetlands and Bioretention systems: To MITS 16 WSUD Features.
> Endwall outlet structures: Paid under this Specification.
> Concrete work for outlet structures: Paid under this Specification and not MITS 10 Concrete works.
## 2.2 Pay items

### Table 3I-10 Pay items table

<table>
<thead>
<tr>
<th>Item No</th>
<th>Pay items</th>
<th>Unit of measurement</th>
<th>Schedule of rates scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>3I.1</td>
<td>Filter material for trench drains (Type A, B, E)</td>
<td>Linear metre of subsoil pipe installed measured along the centreline</td>
<td>All activities extra over Subsoil drains associated with supply, placement and compaction of filtration and capping materials.</td>
</tr>
<tr>
<td>3I.2</td>
<td>Filter material for Type A drainage mats (Type B, C, D)</td>
<td>m² of drainage blanket constructed.</td>
<td>All activities extra over Drainage mats associated with supply, placement and compaction of filtration material.</td>
</tr>
<tr>
<td>3I.3</td>
<td>No fines concrete capping for trench drains</td>
<td>Linear metre of subsoil pipe installed measured along the centreline</td>
<td>All activities extra over Subsoil drains associated with supply and placement of no fines concrete, including formwork.</td>
</tr>
<tr>
<td>3I.4</td>
<td>Endwall outlet structures for subsurface drainage pipes</td>
<td>Number</td>
<td>All activities associated with the construction of outlet structures for subsurface drainage pipe including excavation in all types of material encountered including rock, supply and installation of outlets, concrete formwork, supply, placement, curing and finish of in situ concrete, vermin protection, connection to subsurface drainage and backfill.</td>
</tr>
<tr>
<td>3I.5</td>
<td>Outlet to stormwater structures</td>
<td>Number</td>
<td>All activities associated with the construction of the outlet connection to stormwater structures, including excavation in all types of material encountered including rock, connection to stormwater structures and subsurface drainage, vermin protection, backfilling and making good of all works.</td>
</tr>
</tbody>
</table>